eddies mentioned in part 2. The short period eddies are thought to be due to the reaction between the air stream and surface obstacles and to the friction between the air and the ground. The major eddies, however, are believed to be thermal in their origin and due to convection currents set up in the atmosphere, since they occur only when the lapse rate is favorable for convection. From laboratory experiments on convection in liquids Durst concludes that when the convectional eddies are present the lower portion of the atmosphere takes on a cellular structure, and that each cell contains a convectional eddy which is identical with the major eddy mentioned above. The cells travel with the mean velocity of the wind, while the motion of the air within a cell relative to the mean wind is supposed to be as follows: Relatively cool air moving with the velocity of the upper layers descends in the forward part of the cell; upon contact with the ground, its forward motion is checked and it moves toward the rear of the cell becoming heated and filled with frictional eddies. This air is relatively warm when it nears the rear of the cell and therefore rises to the cell top where it moves forward toward the front of the cell; it then descends again, and the cycle is repeated. The horizontal dimensions of the cells would be the same as those given for the major eddies in part 2, and their heights 1,500 feet or more. This novel theory postulating the existence of atmospheric cells, each containing a convectional eddy, explains a number of the facts revealed by the anemograms, and merits further investigation.

Part 4. The variation of wind with height.—As a result of a study of the records made by instruments at the heights of 30, 40, 50, and 150 feet, it is found that the vertical gradient of wind speed is usually less for light winds than for strong and less by day than by night; and also that the vertical gradient of wind speed depends on the vertical temperature gradient.

Part 5. Application of the results of the investigation to the hydrodynamical theory of turbulence.—Data are given here showing that a strong surface inversion has the effect of reducing the coefficient of turbulence. From the consideration of the equations of motion of a turbulent fluid, it is concluded that when the convectional eddies are present, the simplified form of these equations, in which the coefficient of viscosity is replaced by the coefficient of eddy viscosity, is rigorously applicable only for heights above 1,500 feet.

This investigation appears to be the first of its kind in which simultaneous records have been made not only of wind speed but also of wind direction and of temperature. The concept of the convectional eddy and its theory are entirely new. The memoir represents a searching investigation into wind structure and merits the attention of all who are interested in this branch of meteorology.

It may not be out of place to mention here that a research on wind gustiness was begun several years ago at the University of Michigan by R. H. Sherlock and M. B. Stout and is still in progress. It is anticipated that the final results of this investigation will contribute further to our knowledge of wind structure.

THE TROPICAL STORM OF OCTOBER 30–NOVEMBER 13, 1932

By C. L. MITCHELL

[Weather Bureau, Washington, Dec., 1932]

This storm was remarkable not only for its great intensity so late in the hurricane season, but also because of its unusual path during its early history and its moving into the Caribbean Sea at least two weeks later than any other tropical disturbance of hurricane intensity during the last 50 or more years.

The first evidence of this cyclonic circulation was noted on October 30 about 200 miles east of the island of Guadeloupe, West Indies. The disturbance, which was yet of slight intensity, passed over or near Guadeloupe during the 31st. During the next two days its direction of movement was unexpected, and, for this low latitude, unprecedented. Instead of passing westward a short distance south of Puerto Rico, it moved almost directly southwestward, apparently reaching hurricane intensity on November 2, and it was central approximately 75 miles north of Willemstad, Curacao, Dutch West Indies, the morning of that date. The next day its center passed westward about 50 miles north of Punta Gallinas, Colombia, the northernmost point of South America. For three days—November 2 to November 5, inclusive—the disturbance moved very slowly westward with steadily increasing intensity, the steamship *San Simeon* in lat. 14° 30′ N., long. 79° W., reporting a barometer reading of 28.48 inches and a southeast wind of force 12 at 7 a. m. of the 6th, just as the disturbance started to recurve to the north. During the night of the 8th–9th the storm recurved to the northeast and began to move more rapidly, the center passing near Cayman Brac on the early morning of the 9th. Later in the forenoon it passed inland over Cuba near Santa Cruz del Sur and between 1 p. m. and 2 p. m. it passed to sea again near Nuevitas, where a barometer reading of 28.85 inches and an estimated wind velocity of 125 miles per hour were reported. Charts VIII, IX, and X illustrate this storm on the 7th, 9th, and 11th, and show its track up to the latter date.

During the next several days the storm moved almost directly northeastward, and finally merged on the 13th with an extensive disturbance that passed eastward over the Canadian maritime Provinces and Newfoundland during the 12th–13th. At 8 a. m. of the 12th, St. Georges, Bermuda, reported a pressure of 29.38 inches, but it undoubtedly was lower later in the forenoon, when a maximum wind velocity of 88 miles per hour from the north was registered at that place.

The reports of damage caused by this very severe tropical storm are quite incomplete. Press dispatches indicate that some damage resulted along the northern coasts of Venezuela and Colombia and on Providence Island and Cayman Brac in the western Caribbean Sea. On Providence Island 36 houses were reported destroyed and crops ruined, while on Cayman Brac 69 persons were reported killed, hundreds were injured, and the island almost completely devastated.

The storm damage at Santa Cruz del Sur, Cuba, reached the proportions of a major catastrophe. According to the Associated Press the number of deaths reached 2,500 and less than 10 per cent of the town's 4,000 inhabitants escaped unhurt. The survivors stated that the hurricane began about 3 a. m. of the 9th, later driving the sea into the town and "converting it into a great lake," with scarcely a house left standing. Damages are estimated tentatively at several millions of dollars.

The damage on the island of Jamaica was comparatively small, except that there was over a 50 per cent loss to banana trees in some localities.

Advisory warnings were issued twice daily for a period of two weeks, beginning on October 31.